

The flowchart illustrates the system architecture for a game analysis system, showing the flow of data and processing steps. The components and their interconnections are as follows:

- Input (100):** TELEPHONE INPUT (could be the same unit as 190). It provides VOICE and TEXT input to the INPUT INTERPRETATION module (105).
- Input Interpretation (105):** Processes the input and sends data to the RAW GAME RECORDING database (110).
- Raw Game Recording (110):** Stores the raw game data and sends it to the INPUT PARSING module (115).
- Input Parsing (115):** Processes the parsed data and sends it to the ERROR CORRECTION module (120).
- Error Correction (120):** Corrects errors and sends data to the GAME TRANSACTIONS database (125).
- Game Transactions (125):** Stores game transactions and sends data to the STATISTICAL ANALYSIS module (130).
- Statistical Analysis (130):** Performs statistical analysis and sends data to the GAMES STATISTICS database (135).
- Games Statistics (135):** Stores game statistics and sends data to the UPDATE GROUP OF PLAYER'S AVERAGES module (140).
- Update Group of Player's Averages (140):** Updates player averages and sends data to the GROUP OF PLAYERS AVERAGES database (145).
- Group of Players Averages (145):** Stores player averages and sends data to the TELEPHONE (190) and the REQUEST FOR INFORMATION PROCESSING module (180).
- Telephone (190):** A communication unit that can also be the same as 100. It sends data to the SPEECH GENERATION module (175) and the REQUEST FOR INFORMATION PROCESSING module (180).
- Speech Generation (175):** Generates speech output and sends it to the TELEPHONE (190).
- Request for Information Processing (180):** Processes requests and sends data to the TEXT AND GRAPHICS GENERATION module (185) and the MATCHES ANALYSIS REPOSITORY (170).
- Text and Graphics Generation (185):** Generates text and graphics output and sends it to the EMAIL, SMS, FAX, INSTANT MESSAGING ETC module (196).
- Matches Analysis Repository (170):** Stores match analysis data and sends it to the REQUEST FOR INFORMATION PROCESSING module (180) and the COMPARISONS WITH GROUP AVERAGES module (155).
- Comparisons with Group Averages (155):** Compares data with group averages and sends it to the PATTERNS DETECTION module (150).
- Patterns Detection (150):** Detects patterns and sends data to the STRATEGY RECOMMENDATIONS module (160).
- Improvement Recommendations (165):** Provides improvement recommendations and sends data to the STRATEGY RECOMMENDATIONS module (160).
- Strategy Recommendations (160):** Provides strategy recommendations and sends data to the TELEPHONE (190) and the EMAIL, SMS, FAX, INSTANT MESSAGING ETC module (196).
- Email, SMS, Fax, Instant Messaging Etc (196):** A communication unit that can also be the same as 190. It sends data to the TELEPHONE (190) and the REQUEST FOR INFORMATION PROCESSING module (180).

The flowchart shows a complex system with multiple data paths and feedback loops, involving databases, processing modules, and communication units.

**Fig. 1**

|                                                        |                           |
|--------------------------------------------------------|---------------------------|
| <b>(200) Strok typ (and impli d location on court)</b> |                           |
| <b>Play r n th l ft</b>                                | <b>Play r on th right</b> |
| 1 FH Ground Stroke                                     | 3 FH Ground Stroke        |
| 4 FH Volley                                            | 6 FH Volley               |
| 44 FH Overhead and Serve                               | 66 FH Overhead and Serve  |
| 11 FH Approach                                         | 33 FH Approach            |
| 7 BH Ground Stroke                                     | 9 BH Ground Stroke        |
| * BH Volley                                            | # BH Volley               |
| ** BH Overhead                                         | ## BH Overhead            |
| 77 BH Approach                                         | 99 BH Approach            |

|                               |                           |
|-------------------------------|---------------------------|
| <b>(210) Stroke placement</b> | <b>(220) Stroke error</b> |
| 2 Cross Court; opt. - default | 020(0) Wide               |
| 5 <i>Middle</i>               | 050(0) Net                |
| 8 Down the Line               | 080(0) Long               |
| 0 <i>Inside Out</i>           | 0852(0) Mis-hit           |

|                                |                                     |
|--------------------------------|-------------------------------------|
| <b>(230) Stroke Trajectory</b> | optional (0) indicates forced error |
| 22 Drop shot                   | <b>(240)</b>                        |
| 55 Lob                         | 858 Stroke winner                   |
| 88 Passing shot                |                                     |

|                                                                                  |
|----------------------------------------------------------------------------------|
| <b>(250) Corrections</b>                                                         |
| 15551 Let                                                                        |
| 35553 Point played over                                                          |
| 052 Back over last entry                                                         |
| 0525 Back over last shot entry; Can be repeated up to the previous point entries |
| 0528 Ignore all shots in the point up to the serve in; Entry errors.             |
| 0520 Ignore all shots in the point; Entry errors.                                |

|                                                                                                |
|------------------------------------------------------------------------------------------------|
| <b>(260) Miscellaneous</b>                                                                     |
| 2580 Players switch sides or use player 1 on left, etc. notation (only after concluding entry) |
| 252 Missed some strokes.                                                                       |
| 2255 Missed part of the match, enter complete match score from where recording picks up        |
| 123 Start of a tiebreak                                                                        |
| 13 Lplayer - serve is from deuce court                                                         |
| 79 Lplayer serve is from ad court                                                              |
| 31 Rplayer - serve is from deuce court                                                         |
| 97 Rplayer serve is from ad court                                                              |

|                                                                                     |
|-------------------------------------------------------------------------------------|
| <b>(270) Concluding Entries</b>                                                     |
| **** Point over; Player on the left won. (Optionally followed by Game Score entry)  |
| #### Point over; Player on the right won. (Optionally followed by Game Score entry) |
| 7777 Game over. Player on the left won;                                             |
| 9999 Game over Player on the right won.                                             |
| 4444 Set over. Player on the left won                                               |
| 6666 Set over, Player on the right won.                                             |
| 1111 Match over; Player on the left won. enter complete score                       |
| 3333 Match over; Player on the right won. enter complete score                      |
| #963 Match stopped or postponed                                                     |

Fig. 2

**Fig. 3**

|                                         |                                      |
|-----------------------------------------|--------------------------------------|
| LPLAYERSTROKE :                         | LPLAYERSERVE :                       |
| ( 'PLAYER 1'   'P 1' ) (?)              | ( 'PLAYER 1'   'P 1' ) (?)           |
| PLAYERSTROKE                            | SERVE                                |
|                                         |                                      |
| RPLAYERSTROKE :                         | RPLAYERSERVE :                       |
| ( 'PLAYER 2'   'P 2' ) (?)              | ( 'PLAYER 2'   'P 2' ) (?)           |
| PLAYERSTROKE                            | SERVE                                |
|                                         |                                      |
| PLAYERSTROKE :                          | SERVE :                              |
| ( FORB                                  | 'SERVE'                              |
| ( 'GROUND'   'BASE'   'BASELINE' ) (?)  | ( 'FROM' (?)                         |
| FORB (?) 'VOLLEY'                       | ( 'AD'   'DEUCE' )                   |
| FORB (?) 'OVERHEAD'                     | 'SIDE' (?)                           |
| FORB (?) 'APPROACH'                     | ) (?)                                |
|                                         |                                      |
| FORB :                                  | LET :                                |
| FOREHAND   BACKHAND                     | 'LET'                                |
|                                         |                                      |
| FOREHAND :                              | POINTPLAYEDOVER :                    |
| 'FOREHAND'   'FORE'                     | 'POINT' (?) 'PLAYED OVER'            |
|                                         |                                      |
| BACKHAND :                              | SHOTWINNER :                         |
| 'BACKHAND'   'BACK'                     | 'SHOT' (?) 'WINNER'                  |
|                                         |                                      |
| ERRORTYPE :                             | MATCHOVER:                           |
| ( 'ERROR' 'OUT' ) (?)                   | 'MATCH OVER'                         |
| ( 'WIDE'   'NET'   'LONG'   'MIS-HIT' ) | ( 'PLAYER' ( '1'   '2' ) 'WON' ) (?) |
|                                         |                                      |
| FORCEDERROR :                           | SETOVER:                             |
| 'FORCED'                                | 'SET OVER'                           |
|                                         | ( 'PLAYER' ( '1'   '2' ) 'WON' ) (?) |
|                                         |                                      |
| STROKEPLACEMENT :                       | GAMEOVER:                            |
| 'CROSS' 'COURT' (?)   'MIDDLE'          | 'GAME OVER'                          |
| 'DOWN' (?) 'THE' (?) 'LINE'             | ( 'PLAYER' ( '1'   '2' ) 'WON' ) (?) |
| 'INSIDE OUT'                            |                                      |
|                                         |                                      |
| STROKETRAJECTORY :                      | POINTOVER :                          |
| 'DROP SHOT'   'LOB'                     | 'POINT OVER'                         |
| 'PASSING SHOT'                          | ( 'PLAYER' ( '1'   '2' ) 'WON' ) (?) |

Fig. 4

```
LPLAYERSTROKE :  
  '44' | '11' | '1' | '4' |  
  '**' | '77' | '7' | '**'  
  
RPLAYERSTROKE :  
  '66' | '33' | '3' | '6' |  
  '##' | '99' | '9' | '#'  
  
ERRORTYPE :  
  '020' | '050' | '080' | '0852'  
  
FORCEDERROR :  
  '0'  
  
STROKEPLACEMENT :  
  '2' | '5' | '8' | '0'  
  
STROKETRAJECTORY :  
  '22' | '55' | '88'  
  
LPLAYERSERVE :  
  '44'  
  
RPLAYERSERVE :  
  '66'  
  
LET :  
  '15551'  
  
POINTPLAYEDOVER :  
  '35553'  
  
SHOTWINNER :  
  '858'  
  
MATCHOVER:  
  '1111' | '3333'  
  
SETOVER:  
  '4444' | '6666'  
  
GAMEOVER:  
  '7777' | '9999'  
  
POINTOVER :  
  '****' | '####'
```

Fig. 5

## MATCH INFO

610

| PLAYERS  | NAME        | WINNER |
|----------|-------------|--------|
| PLAYER 1 | JOHN DOE    |        |
| PLAYER 2 | JOHN DOE JR | X      |

620

|                     |               |
|---------------------|---------------|
| MATCH DATE AND TIME | JULY 24, 2003 |
| MATCH DURATION      | 3 HOURS       |
| TYPE OF RECORDING   | ALL STROKES   |

630

| MATCH SCORE |       |       |       |       |       |
|-------------|-------|-------|-------|-------|-------|
| PLAYER      | SET 1 | SET 2 | SET 3 | SET 4 | SET 5 |
| PLAYER 1    | 6     | 3     | 3     |       |       |
| PLAYER 2    | 4     | 6     | 6     |       |       |

## MATCH STATISTICS FOR John Doe Jr.

640

| SUMMARY STATISTICS          |     |     |
|-----------------------------|-----|-----|
| POINTS PLAYED               | 140 |     |
| POINTS WON                  | 85  | 70% |
| WINNERS                     | 10  | 7%  |
| ERRORS                      | 45  | 32% |
| UNFORCED ERRORS             | 35  | 25% |
| BREAK CHANCES               | 3/7 |     |
| BROKEN SERVICE GAMES        | 3   | 21% |
| FIRST SERVE CONSISTENCY     | 60% |     |
| RETURN OF SERVE CONSISTENCY | 70% |     |

650

## WINNERS AND ERRORS BY STROKE

|         | SERVE 1 | SERVE 2 | FH RETU RN | BH RETU RN | FH BASE LINE | BH BASE LINE | FH VOLL EY | BH VOLL EY | FH OVER HEAD | BH OVER HEAD | FH APPR OACH | BH APPRO ACH |
|---------|---------|---------|------------|------------|--------------|--------------|------------|------------|--------------|--------------|--------------|--------------|
| WINNERS | 2       | 0       | 1          | 0          | 1            | 1            | 1          | 0          | 2            | 0            | 2            | 0            |
| ERRORS  | 42      | 10      | 4          | 6          | 4            | 9            | 1          | 3          | 1            | 2            | 1            | 4            |
| BALANCE | -40     | -10     | -4         | -6         | -3           | -8           | 0          | -3         | +1           | -2           | +1           | -4           |

Fig. 6

Forehand ground stroke analysis

700

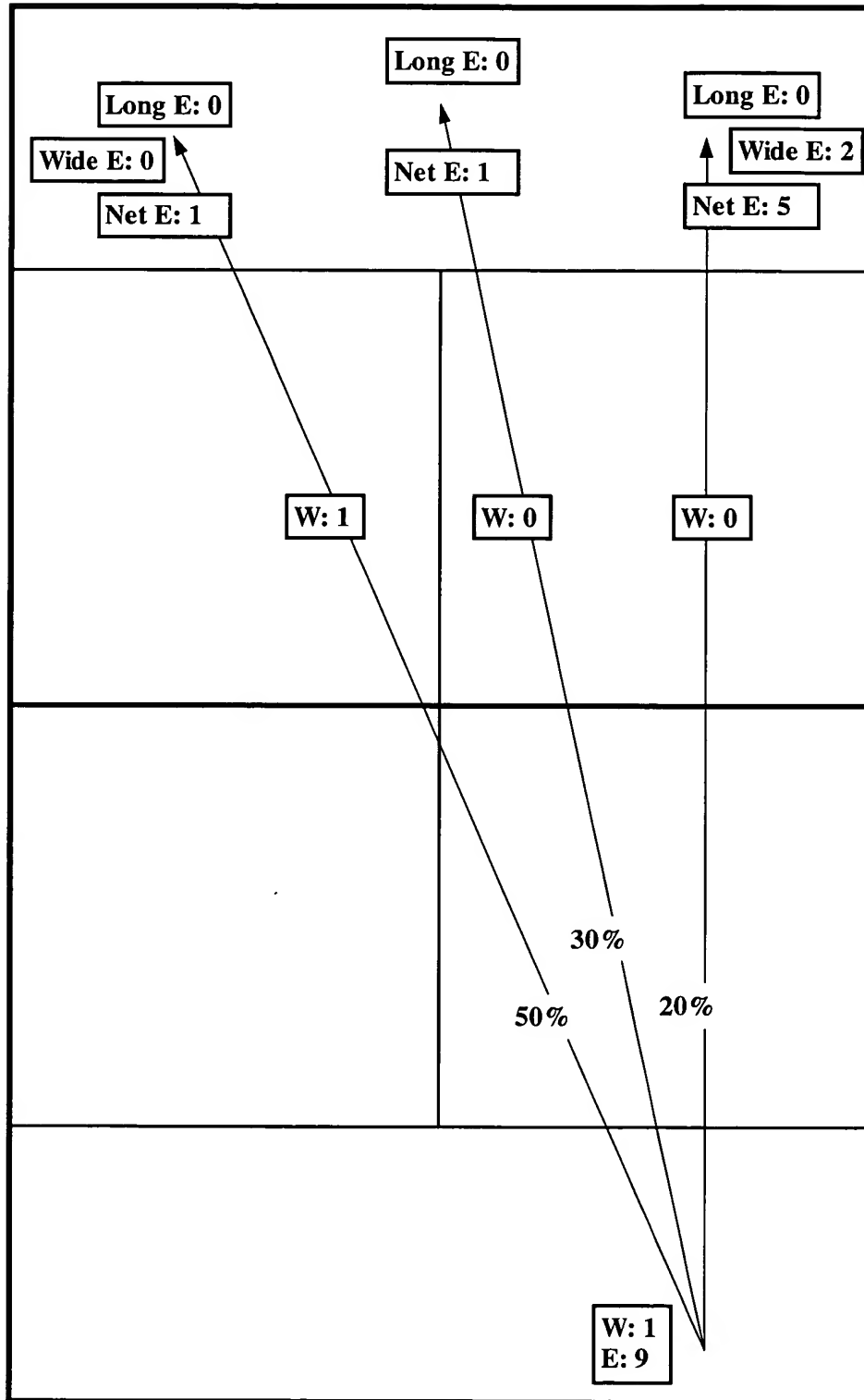


Fig. 7

810

### PointInfo Table Schema

|    | Field             | Type             | Attributes | Null | Default |
|----|-------------------|------------------|------------|------|---------|
| PK | RedD              | int(10)          | UNSIGNED   | No   | 0       |
| PK | PointInMatch      | int(10)          | UNSIGNED   | No   |         |
|    | PointInGame       | int(10)          | UNSIGNED   | No   | 0       |
|    | PlayedOver        | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | WinningPlayerSide | enum('LP', 'RP') |            | Yes  | NULL    |
|    | WinningPlayerRef  | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | WinnerOrError     | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | ServingPlayerRef  | tinyint(1)       |            | Yes  | 0       |
|    | FirstServeIn      | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | SecondServeIn     | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | LPlayerRef        | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | RPlayerRef        | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | LPEnteredScore    | varchar(5)       |            | Yes  |         |
|    | RPEnteredScore    | varchar(5)       |            | Yes  |         |
|    | LPRunningScore    | varchar(5)       |            | Yes  |         |
|    | RPRunningScore    | varchar(5)       |            | Yes  |         |
|    | CompleteRecording | tinyint(1)       | UNSIGNED   | Yes  | 0       |
|    | RecordingErrors   | tinyint(1)       | UNSIGNED   | Yes  | 0       |

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### StrokeInfo Table Schema

|    | Field            | Type                                                                             | Attributes | Null | Default |
|----|------------------|----------------------------------------------------------------------------------|------------|------|---------|
| PK | RedD             | int(10)                                                                          | UNSIGNED   | No   | 0       |
| PK | StrokeInMatch    | int(10)                                                                          | UNSIGNED   | No   |         |
|    | PointInMatch     | int(10)                                                                          | UNSIGNED   | No   | 0       |
|    | StrokeInPoint    | int(10)                                                                          | UNSIGNED   | No   | 0       |
|    | PlayerRef        | tinyint(1)                                                                       | UNSIGNED   | No   | 0       |
|    | StrokeType       | enum('Serve1', 'Serve2',<br>'GroundStroke', 'Volley',<br>'Overhead', 'Approach') |            | No   | Serve1  |
|    | FH               | tinyint(1)                                                                       | UNSIGNED   | No   | 0       |
|    | StrokePlacement  | enum('CrossCourt',<br>'Middle', 'DownTheLine',<br>'InsideOut')                   |            | Yes  | NULL    |
|    | StrokeTrajectory | enum('DropShot', 'Lob',<br>'PassingShot')                                        |            | Yes  | NULL    |
|    | Let              | tinyint(1)                                                                       | UNSIGNED   | Yes  | 0       |
|    | Winner           | tinyint(1)                                                                       | UNSIGNED   | Yes  | 0       |
|    | ErrorType        | enum('Wide', 'Net', 'Long',<br>'Mishit')                                         |            | Yes  | NULL    |
|    | ForcedError      | tinyint(1)                                                                       | UNSIGNED   | Yes  | 0       |
|    | StartRedIndex    | int(10)                                                                          | UNSIGNED   | No   | 0       |
|    | EndRedIndex      | int(10)                                                                          | UNSIGNED   | No   | 0       |

Fig. 8



| Voice notation for recording singles tennis matches                                                                                                                                                         |           |              |                 |               |                                                                                                     |           |          |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|-----------------|---------------|-----------------------------------------------------------------------------------------------------|-----------|----------|----------|
| 910                                                                                                                                                                                                         |           |              |                 |               |                                                                                                     |           |          |          |
| Serve Information entries                                                                                                                                                                                   |           |              |                 |               |                                                                                                     |           |          |          |
| Player ?                                                                                                                                                                                                    | 1st/2nd ? | Stroke       | Position ?      | Placement ?   | Error?                                                                                              | Err Type? | Winner ? | Let ?    |
| player 1                                                                                                                                                                                                    | first     |              | ad              | cross         | error                                                                                               | net       | winner   | let      |
| p 1                                                                                                                                                                                                         | second    | serve        | from ad         | cross court   | out                                                                                                 | long      | ace      |          |
| player 2                                                                                                                                                                                                    |           |              | from ad side    | middle        |                                                                                                     | wide      |          |          |
| p 2                                                                                                                                                                                                         |           |              | deuce           | center        |                                                                                                     | miss-hit  |          |          |
| Player should be given for the first serve of the match, or after input is not recognized or recording is interrupted.                                                                                      |           |              | from deuce      | line          | Error/Winner/Let are mutually exclusive                                                             |           |          |          |
|                                                                                                                                                                                                             |           |              | from deuce side | down line     |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             |           |              |                 | down the line |                                                                                                     |           |          |          |
| 1. Synonym entries are grouped in boxes, e.g. "forehand" and "fore"<br>2. "?" After entry heading means - entry is optional<br>3. Entries should be given in the order from left to right, unless specified |           |              |                 |               |                                                                                                     |           |          |          |
| 920                                                                                                                                                                                                         |           |              |                 |               |                                                                                                     |           |          |          |
| Stroke information entries                                                                                                                                                                                  |           |              |                 |               |                                                                                                     |           |          |          |
| Player ?                                                                                                                                                                                                    | Side      | Stroke ?     | Placement ?     | Trajectory ?  | Error?                                                                                              | Err Type? | Forced ? | Winner ? |
| player 1                                                                                                                                                                                                    | forehand  | ground       | cross           | drop shot     | error                                                                                               | net       | forced   | winner   |
| p 1                                                                                                                                                                                                         | fore      | base         | cross court     | lob           | out                                                                                                 | long      |          |          |
| player 2                                                                                                                                                                                                    | backhand  | baseline     | middle          | passing shot  |                                                                                                     | wide      |          |          |
| p 2                                                                                                                                                                                                         | back      | volley       | center          |               |                                                                                                     | miss-hit  |          |          |
| If stroke is not specified, ground stroke is assumed                                                                                                                                                        |           |              | line            |               | 1. If not given, unforced error is assumed<br>2. forced may be given only if error is given         |           |          |          |
|                                                                                                                                                                                                             |           |              | overhead        |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             |           |              | approach        |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             |           |              | down line       |               | Placement and Trajectory may be given in any order<br>Err Type may be given only if Error is given. |           |          |          |
|                                                                                                                                                                                                             |           |              | down the line   |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             |           |              | inside out      |               |                                                                                                     |           |          |          |
| 930                                                                                                                                                                                                         |           |              |                 |               |                                                                                                     |           |          |          |
| Concluding entries                                                                                                                                                                                          |           |              |                 |               |                                                                                                     |           |          |          |
| Segment                                                                                                                                                                                                     | Over      | Player ?     |                 |               |                                                                                                     |           |          |          |
| point                                                                                                                                                                                                       |           | player 1 won |                 |               |                                                                                                     |           |          |          |
| game                                                                                                                                                                                                        | over      | p 1 won      |                 |               |                                                                                                     |           |          |          |
| set                                                                                                                                                                                                         |           | player 2 won |                 |               |                                                                                                     |           |          |          |
| match                                                                                                                                                                                                       |           | p 2 won      |                 |               |                                                                                                     |           |          |          |
| 940                                                                                                                                                                                                         |           |              |                 |               |                                                                                                     |           |          |          |
| Score entries                                                                                                                                                                                               |           |              |                 |               |                                                                                                     |           |          |          |
| Prefix                                                                                                                                                                                                      | Entry 1   | Entry 2      |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             |           | ad in        |                 |               |                                                                                                     |           |          |          |
| score                                                                                                                                                                                                       |           | ad out       |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             |           | deuce        |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             | 0         | 0            |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             | love      | love         |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             | 15        | 15           |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             | 30        | 30           |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             | 40        | 40           |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             | 1-14      | 1-14         |                 |               |                                                                                                     |           |          |          |
|                                                                                                                                                                                                             |           | dl           |                 |               |                                                                                                     |           |          |          |

Fig. 9